

domestication is evidenced during the Woodland period. Native plants and grasses were probably tended and harvested.

Villager Period (1,200 –500 years BP)

The people of the Villager period lived mainly in permanent villages on fertile stream valley soils. Hunting was predominately for bison and deer, with fish and mussels being important dietary additions. Farming villages harvested foods such as corn, beans, and squash, along with tobacco. During this time, the people of what is now eastern Oklahoma composed a highly-ranked religious society that was supported by farming. The people who inhabited what is now western Oklahoma were farmers that built concentrated villages along the Washita River and its tributaries. Aside from farming, bison was another primary food source and the villages used the entire animal for food, tools, and clothing.

3.2.1.2.2 Protohistoric and Historic Periods (500 years BP–Present)

The protohistoric period in what is now considered Oklahoma was marked by European contact with the American Indians. With this contact, weighty changes occurred to the American Indian culture. Spanish horses were introduced and became a major part of the culture, along with formerly unknown disease.

Oklahoma was not as impacted by foreign born settlers as other States were due to the manner in which the land was opened to settlement. Land was distributed by lotteries, which made it difficult for extended families to find plots together (Baxter 1986). Early historic settlement by western and northern European immigrants began in the late 18th and early 19th centuries.

European settlement of the ROI portion of Oklahoma occurred around this same time period and was predominantly by Czechs, Germans, Poles, and Mennonites from Russia (Baxter 1986). Not all settlers were interested in farming, and many took to other occupations such as railroad work, coal mining, oil industry work, and ore smelting.

Table 9. Archeological sites within the ROI.

County	Watershed	Number of Archaeological Sites by Prehistoric Period
Adair	Tenkiller	PaleoIndian (2), Archaic (30), Woodland (9), Villager (9)
Cherokee	Tenkiller	PaleoIndian (2), Archaic (69), Woodland (19), Villager (23)
Delaware	Tenkiller, Spavinaw	PaleoIndian (0), Archaic (23), Woodland (17), Villager (63)
Mayes	Spavinaw	PaleoIndian (1), Archaic (35), Woodland (25), Villager (31)
Sequoyah	Tenkiller	PaleoIndian (1), Archaic (41), Woodland (15), Villager (35)
<i>Source: OAS 2006</i>		

3.2.2 Architectural Resources

3.2.2.1 Description

Architectural resources are standing structures that are usually over 50 years of age and of significant historic or aesthetic value. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.2.2.2 Affected Environment

Architectural resources in Oklahoma include structures such as schools, mills, homesteads, hotels, seminaries, libraries, armories, and churches. Architectural properties in Oklahoma are mostly focused

around the lifestyles and cultures of Euro-American exploration, American Indian culture, railroad construction, oil industry, and mining towns. There are 18 architectural sites within the ROI that are listed in NRHP (Table 10) (Oklahoma State Historic Preservation Office [OSHPO] 2005a).

Table 10. Properties within the ROI listed in NRHP.

County	Watershed	Number of Properties	NRHP Property and Location
Adair	Tenkiller	4	Stilwell: Adair County Courthouse, Golda's Mill Westville: Buffington Hotel, Opera Block
Cherokee	Tenkiller	14	Park Hill: Murrel Home Tahlequah: Alston-Bedwell House, Cherokee Female Seminary, Cherokee National Capitol, Cherokee National Jail, Cherokee Supreme Court Building, Dr. Irwin D. Loeser Log Cabin, First Cherokee Female Seminary Site, French-Parks House, Indian University of Tahlequah, Joseph M. Thompson House, Leonard M. Logan House, Tahlequah Armory, Tahlequah Carnegie Library
Source: OSHPO 2005a			

3.2.3 Traditional Cultural Properties

3.2.3.1 Description

Traditional cultural properties (TCPs) hold importance to American Indians or other ethnic groups for the continuing practice of traditional culture. Any of these properties may meet the criteria for inclusion in the NRHP and this determination of eligibility (36 CFR 8 parts 800.3–800.13, 2005) is a requirement of Federal and State environmental assessment processes before the initiation of ground disturbance or alteration of a landscape or structure. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.2.3.2 Affected Environment

There are four TCPs within the ROI that are recognized by NRHP (Table 11). The grave of Reverend Jesse Bushyhead, a significant religious and political leader of the Cherokee Nation, was listed in 2004. Ross Cemetery, listed in 2002, is the burial place of Chief John Ross, who was a principal Chief of the Cherokee Nation during the Civil War. The Illinois Campground was listed in 2004 and designates the point on the Trail of Tears at which Chief Ross disbanded his detachment. The Polson Cemetery, located near the town of Jay, was listed in 1977 because it contains the stone marker of Confederate General Stand Watie.

Table 11. TCPs within the ROI.

County	Watershed	Number of Properties	Traditional Cultural Properties
Adair	Tenkiller	1	Westville: Reverend Jesse Bushyhead Grave
Cherokee	Tenkiller	2	<u>Park Hill</u> : Ross Cemetery <u>Tablequah</u> : Illinois Campground
Delaware	Spavinaw	1	<u>Jay</u> : Polson Cemetery
Source: OSHPO 2005a			

3.3 Water Resources

3.3.1 Surface Water

3.3.1.1 Description

Surface water includes rivers, streams, and lakes, including those designated as impaired. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.1.2 Affected Environment

Section 303(d) of the *Clean Water Act* establishes water quality standards and every two years States must compile a list of waterbodies within their jurisdiction that do not meet these standards (33 USC 26 parts 1251 et seq., 2000). These lists, which identify the impairments to each waterbody, are commonly known as *303(d) lists*. Once the list is complete, each jurisdiction must then determine priority rankings for these waters and establish total maximum daily loads (TMDLs) for each. A TMDL is the maximum amount of pollutants a waterway can receive daily and still meet water quality standards (EPA 2005b). Impairments to waterways within the ROI include the presence of phosphorus and nitrates, low dissolved oxygen content, pathogens, and high levels of turbidity (Table 12). A listing of all waterbodies within the ROI is provided in Appendix E.

The number one cause of water impairments within the ROI is excessive nutrient loading (EPA 2002a). This is due in large part to the practice of fertilizing grazing land by applying poultry litter. Within the Tenkiller watershed, Baron (Barren) Fork, Caney Creek, Flint Creek, Illinois River, and Tenkiller Ferry Lake are listed as impaired due to an excess of phosphorus, and Sager Creek is impaired due to excess nitrates (Table 12). Lake Eucha and Spavinaw Lake in the Spavinaw watershed are also impaired due to high levels of phosphorus (Table 12) (EPA 2002a). The loading of nutrients can instigate eutrophication, which causes waterways to age in succession prematurely and triggers excess plant growth, such as algae blooms and aquatic weeds. Algae blooms occur naturally but with more frequency and severity in the presence of nutrients (NRCS 1994). When the algae die, they sink to the bottom of the waterway which often stimulates an increase in bacteria and other decomposers. As these decomposers increase in numbers, they deplete the dissolved oxygen supply within the waterway (NRCS 1994). Sometimes the respiration from the algae growth creates enough oxygen to offset the use of the oxygen by the decomposers. If there is not a balance, eutrophication can occur. An excess of nutrients can contribute to a variety of other water quality issues, such as decreased water clarity, fish kills, and a bad taste and odor to the water (NRCS 1994).

Table 12. Surface water impairments in the ROI.

Watershed	Waterbody	Impairment	Priority
Tenkiller	Baron (Barren) Fork	Phosphorus, pathogens	High
	Caney Creek	Phosphorus, turbidity	High
	Chicken Creek	Unspecified*	High
	Flint Creek	Phosphorus, pathogens	High
	Illinois River	Phosphorus, pathogens, turbidity	High
	Sager Creek	Nitrates, pathogens	High
	Stillwater City Lake	Low dissolved oxygen content	High
	Tahlequah Creek, Town Branch	Pathogens	High
	Tenkiller Ferry Lake	Phosphorus, low dissolved oxygen content	High
Spavinaw	Beaty Creek	Pathogens	High
	Lake Eucha	Phosphorus, low dissolved oxygen content	High
	Spavinaw Lake	Phosphorus, low dissolved oxygen content	High
<p><i>*The water quality standard for warm water aquatic community beneficial use is not attained. Chicken Creek is impaired by an unspecified pollutant(s) and requires a TMDL. Establishment of TMDL(s) is scheduled for 2009 (Oklahoma Department of Environmental Quality [ODEQ] 2002a).</i></p> <p><i>Source: EPA 2002a</i></p>			

Dissolved oxygen is necessary for fish and other aquatic species to live. Stillwater City Lake and Tenkiller Ferry Lake in the Tenkiller watershed are listed as impaired due to low dissolved oxygen content (Table 12). Within the Spavinaw watershed, Lake Eucha and Spavinaw Lake are impaired due to low dissolved oxygen (Table 12) (EPA 2002a). Dissolved oxygen content can be altered by any number of factors such as volume, velocity, temperature, altitude, aquatic species present, vegetation, nutrient loading, and total dissolved solids within the waterway (EPA 1997). Low dissolved oxygen levels within the ROI may occur from the fast growth of vegetation and nutrient loading that result from organic pollution (e.g., poultry litter). When high levels of vegetation and other organic matter is introduced to the waterway, it increases the number of decomposers. The increased populations of decomposers require more oxygen than what was previously needed, thus the dissolved oxygen in the water decreases (EPA 1997). Fluctuating dissolved oxygen levels may cause some aquatic species to die or leave their current habitat.

Pathogens can enter waterways through numerous sources such as untreated sewage and livestock feces. Within the Tenkiller watershed, Baron Fork, Flint Creek, Illinois River, Sager Creek, and Tahlequah Creek are listed as impaired due to the presence of pathogens (Table 12). Beaty Creek in the Spavinaw watershed is also listed as impaired due to pathogens (Table 12) (EPA 2002a). The presence of pathogens may include bacteria, protozoa, viruses, and helminthes (i.e., parasitic worms) (EPA 2002b). Bacteria pathogens have been linked to typhoid fever and cholera. Protozoan pathogens have been linked to *Giardia lamblia* and *Cryptosporidium parvum* (EPA 2002b). Viruses are the cause of Hepatitis A and polio. All forms of pathogens can be infectious to those drinking, swimming, or handling pathogen-polluted waters. Surface water is usually tested for the presence of bacteria that indicate the presence of

human or animal waste. These water quality indicators include bacteria such as fecal coliforms, total coliforms, and *Escherichia coli* (EPA 2002b).

Turbidity is a measure of water clarity, which is affected by the presence of sediments suspended in the water column (EPA 1997). In the Tenkiller watershed, Caney Creek and the Illinois River are listed as impaired due to high turbidity (Table 12) (EPA 2002a). Waterways with heavy suspended sedimentation loads have lower dissolved oxygen contents because the suspended particles reduce light penetration, affecting photosynthesis. Water temperature is warmer in waters with high turbidity because the suspended particles absorb heat; warmer water also lowers dissolved oxygen content (EPA 1997). Turbidity can affect aquatic species reproduction when sediments smother eggs and larvae on slow moving stream or river bottoms. High turbidity can be a result of events such as soil erosion, excessive algae growth, and waste discharge (EPA 1997).

3.3.2 Groundwater

3.3.2.1 Description

Groundwater refers to subsurface hydrologic resources such as aquifers that are used for domestic, agricultural, and industrial purposes. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.2.2 Affected Environment

The Tenkiller and Spavinaw watersheds are within the Oklahoma Water Resources Board (OWRB) Northeast Planning Region (OWRB 1995). Two of the four major groundwater basins within this region are in the Tenkiller and Spavinaw watersheds. One, the Roubidoux aquifer, is a fractured dolomite aquifer that yields 150–600 gallons per minute (gpm) of moderately hard water (OWRB 1995). The other, the Keokuk-Reed Springs aquifer, is formed of residual chert, clay, and cherty limestone. Surface springs within this aquifer can yield 600–3,500 gpm, while wells from the formation yield on average 1–10 gpm (OWRB 1995).

3.3.3 Wetlands

3.3.3.1 Description

Wetlands are defined by the U.S. Army Corps of Engineers (USACE) as areas that are characterized by a prevalence of vegetation adapted to saturated soil conditions. Wetlands can be associated with surface water or groundwater and are identified based on specific soil, hydrology, and vegetation. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.3.2 Affected Environment

The 1987 USACE Wetland Delineation Manual (USACE 1987) provides guidelines to identify and delineate wetlands. For regulatory purposes under the *Clean Water Act*, wetlands are defined as:

“Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.” (33 CFR 3 part 328.3, 2005)

At one time Oklahoma landscapes held roughly 2,842,600 acres of wetlands, approximately 67 percent more than the current acreage (Association of State Wetland Managers [ASWM] 2004). Most wetland

areas have been converted to agricultural croplands or have been degraded due to channelization, streamflow regulation, and impoundments. Only 949,700 acres of wetlands remained in Oklahoma as of 2004 (ASWM 2004). Most wetlands within Oklahoma are palustrine wetlands and comprised of bottomland-hardwoods, marshes, and wet meadows (ASWM 2004). Wetlands may occur within the ROI.

3.3.4 Floodplains

3.3.4.1 Description

In this analysis, floodplains are defined as 100-year floodplains, designated by the Federal Emergency Management Agency (FEMA) as those low-lying areas that are subject to inundation by a 100-year flood (i.e., a flood that has a 1 percent chance of being equaled or exceeded in any given year). The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.4.2 Affected Environment

In general, a floodplain can be defined as a flat area, located adjacent to a stream channel that provides natural storage for water overflow during or after a storm event. EO 11988, *Floodplain Management*, requires that Federal agencies:

“...take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains...” (42 FR 26951, 1979)

As the Oklahoma CREP agreement would intend to enroll riparian lands, it is expected that some of the eligible land would be located within floodplains. However, the type of floodplain (e.g., 100-year floodplain) cannot be determined without an exact site location and a FEMA floodplain map. Site specific evaluations would be conducted prior to enrolling a site into CREP to determine if the site is within, or would impact, a 100-year floodplain.

3.4 Soil Resources

3.4.1 Description

For the purposes of this analysis, soil resources are topography, soil, and paleontological resources. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.4.2 Affected Environment

3.4.2.1 Topography

The three major physiographic regions in Oklahoma are the Atlantic Plain, the Interior Plains, and the Interior Highlands (National Park Service 2000, Ryder 1996). The Atlantic Plain lies along the southeastern edge of the State and is the flattest of the provinces. The Interior Plains account for the largest area of Oklahoma. This province also appears relatively flat, but actually slopes gently to the east.

The ROI lies within the Interior Highlands, which lie along the eastern portion of the State. This region is divided into two provinces that display similar landform characteristics. The Ozark Plateau to the north is characterized by broad, flat-topped hills and narrow river valleys. The Ouachita province to the south consists of the Arkansas River Valley and the Ouachita Mountains, a series of steeply folded ridges and

valleys. The Tenkiller and Spavinaw watersheds are located primarily within the Ozark Plateau, with the southern portion of the Tenkiller watershed reaching into the Ouachita province (Figure 3).

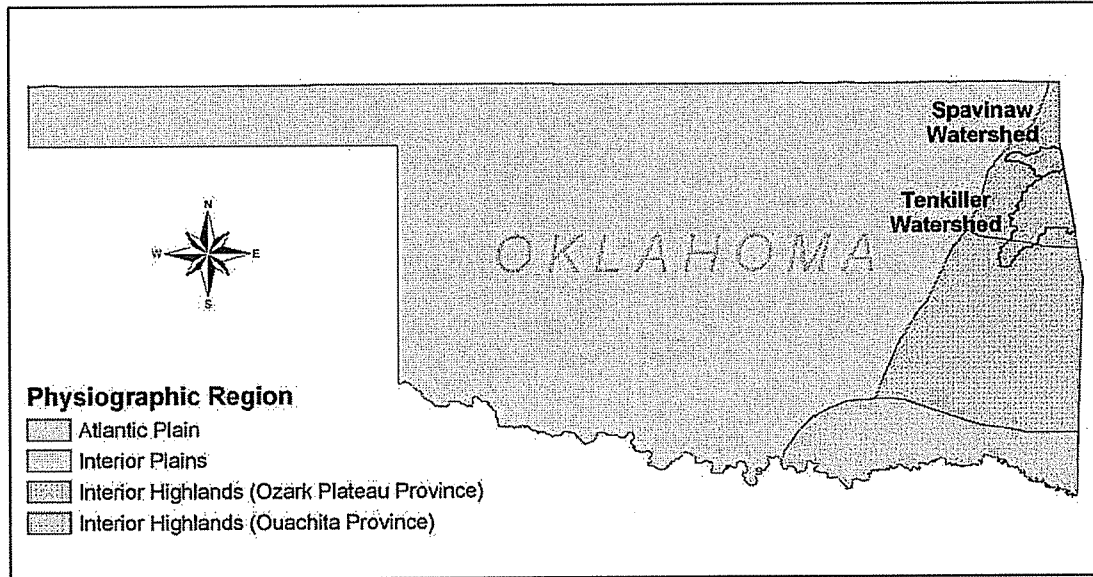


Figure 3. Physiographic provinces of Oklahoma (modified from Ryder 1996).

3.4.2.2 Soil

For this analysis, soils are described by Level IV Ecoregion (Woods et al. 2005, University of Idaho 2006) (Figure 2, Table 13). Soils in the ROI include mollisols, entisols, inceptisols, vertisols, alfisols, and ultisols. Mollisols are the typical soils of grassland ecosystems and are characterized by a thick, dark surface horizon. They are rich in organic materials and thus very productive agriculturally. Mollisols are common to every ecoregion within the ROI.

Entisols are very diverse and are developed in unconsolidated parent material. They usually lack genetic horizons except an A horizon. Ecoregions that contain entisols include the Arkansas River Floodplain and the Dissected Springfield Plateau-Elk River Hills.

Inceptisols exhibit minimal horizon development and can occur in a wide range of ecological settings. This soil type is found in the Arkansas River Floodplain and Lower Boston Mountains.

Vertisols are clay-rich soils that shrink and swell with changes in moisture content, and thus tend to lack distinct, well-developed horizons. Vertisols are found in the ROI only within the Arkansas River Floodplain.

Alfisols are relatively fertile and tend to be very productive for both agriculture and silviculture. Ecoregions with these soil types are the Dissected Springfield Plateau-Elk River Hills and the Springfield Plateau.

Ultisols are strongly leached and acidic soils with relatively low native fertility. Clays accumulate in the subsurface horizon and soils often display a strong yellowish or reddish color resulting from the presence

of iron oxides. These soils are found in the Dissected Springfield Plateau-Elk River Hills, Lower Boston Mountains, and the Springfield Plateau.

Table 13. Common soils in the Level IV Ecoregions of the ROI.

Level IV Ecoregion	Watershed	Order	Common Soil Series
Arkansas River Floodplain	Tenkiller	Mollisols, Entisols, Inceptisols, and Vertisols	Severn, Moreland, Coughatta, Choska, Kiomatia, Oklared, and Roebuck
Dissected Springfield Plateau-Elk River Hills	Tenkiller, Spavinaw	Ultisols and Alfisols on hillsides, ridgetops, and dissected uplands; Entisols, Alfisols, and Mollisols on floodplains and low terraces	Bodine, Baxter, Clarksville, Etowah, Sallisaw, Elsah, Staser, and Huntington
Lower Boston Mountains	Tenkiller	Ultisols and Inceptisols on uplands; Inceptisols and Mollisols on floodplains and low terraces	Hector, Linker, Nella, Enders, Mountainburg, Steprock, Rosebloom, Mason, Huntington, and Ennis
Springfield Plateau	Tenkiller, Spavinaw	Ultisols, Alfisols, and Mollisols on uplands; Mollisols on floodplains and low terraces	Bodine, Baxter, Eldorado, Craig, Jay, Captina, Etowah, and Huntington
<i>Source: Woods et al. 2005</i>			

3.4.2.3 Paleontological Resources

Paleontological resources are closely associated to geologic settings. Geological settings can be used to predict the occurrence of fossils, their type, abundance, and quality of preservation. As described by USGS (2004), the Interior Highlands of Oklahoma are ancient, eroded mountains composed of carbonate and other sedimentary rocks that were originally deposited on the sea floor and eventually contorted by folds and faults.

Oklahoma geologic strata yield plant, invertebrate, vertebrate, and trace fossils from the relatively recent Pleistocene Epoch (10,000 years to 1.6 million BP) back through the Cambrian Period (505–570 million years BP). Vertebrate fossils include those from fish, amphibians, reptiles, dinosaurs, birds, and mammals (Bureau of Land Management 2005).

Paleontological resources may be considered part of the national natural, scientific, and educational heritage. There is currently no unified Federal policy regarding the treatment of paleontological resources outside of an archaeological context; however, various historic, cultural, or natural resource preservation statutes may apply to fossil resources on State and Federal lands.

3.5 Air

3.5.1 Description

Although the *Clean Air Act* (42 USC 85 parts 7401 et seq., 1999) is a Federal law, States are generally responsible for implementing the Act. Each State is required by EPA to develop a State Implementation Plan that contains strategies to achieve and maintain National Ambient Air Quality Standards (NAAQS). NAAQS establish limits for six criteria pollutants including ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, lead, and respirable particulates (particulate matter less than 10 microns in diameter).

Areas that violate air quality standards are designated as non-attainment areas for the relevant pollutants. Areas that comply with air quality standards are designated as attainment areas for relevant pollutants.

The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.5.2 Affected Environment

The ODEQ air quality division is responsible for ensuring that the air quality in Oklahoma meets or exceeds the levels required by Federal and State standards. To ensure Oklahoma is meeting NAAQS, ODEQ operates an air quality network. This network monitors ambient air quality with 62 monitors at 37 sites throughout the State (ODEQ 2003). There are no air quality monitors within the ROI.

Oklahoma has relatively clean air and meets all State and Federal ambient air quality standards. There are no non-attainment areas within the ROI or the State (EPA 2006b).

3.6 Recreation

3.6.1 Description

Recreational resources are those activities or settings, either natural or anthropogenic, designated or available for recreational use by the public. In this analysis, recreational resources include lands and waters used by the public for hunting, fishing, wildlife viewing, hiking, canoeing, and other water-related activities. The ROI for this resource includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.6.2 Affected Environment

Lands that could be enrolled in CREP are privately held; therefore, access to these lands is and would be controlled by the landowners. Public lands available for recreation within the ROI includes nine State parks, three wildlife management areas (WMAs), and two game management areas (GMAs). A WMA is land owned, licensed, leased, or under the management of ODWC (ODWC 2005b). WMAs are managed based on certain objectives such as game management, public hunting, waterfowl refuge, wetland development, or migratory bird refuge. GMAs are very similar in function to WMAs, but hunting and public uses in these areas are more strictly regulated (ODWC 2005b).

Portions of the 15,469-acre Cookson WMA, the 31,360-acre Cherokee GMA, the 2,590-acre Tenkiller WMA, and the 566-acre Sparrowhawk WMA lie within the Tenkiller watershed (ODWC 2005d). The 14,316-acre Spavinaw GMA lies within the Spavinaw watershed (ODWC 2005d). All WMAs and GMAs offer some hunting, fishing, boating, camping, hiking, and wildlife viewing opportunities to the public. Hunting and fishing, regardless of whether the land is public or private, requires an Oklahoma State license. A discussion of the economics associated with hunting, fishing, and other recreational activities is provided in Sections 3.7 and 4.7.

There is one national wildlife refuge (NWR), the Ozark Plateau NWR, within the Tenkiller watershed portion of the ROI. However, to protect fragile bat habitat, this NWR is not open to the public.

3.7 Socioeconomics

3.7.1 Description

Socioeconomic analyses generally include investigations of population, income, employment, and housing conditions of a specific area. Socioeconomic issues that are significant and considered in detail in

this analysis are non-farm and farm employment and income, farm production expenses and returns, agricultural land use, and recreation spending in the ROI. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.7.2 Affected Environment

The total population within the ROI was 177,977 people in 2000, which was a 20.5 percent increase from the population of 1990 (USCB 1990a, 2000b). Approximately 26.5 percent of the total population was located in urban areas, and 73.5 percent of the population was located within rural areas (USCB 2000c). This was an increase of 2.4 percent from the 1990 urban population (USCB 1990b).

3.7.2.1.1 Non-Farm Employment and Income

Between 1993 and 2002, the non-farm labor force within the ROI ranged from 71,261 in 1993 to 80,341 in 2002 (Bureau of Labor Statistics [BLS] 2005). Non-farm employment also ranged during this period from a low of 66,227 positions in 1993 to a high of 76,488 positions in 2001 (BLS 2005). The unemployment rate within the ROI varied from a high of 3.8 percent in 1993 to a low of 2.0 percent in 2000 (BLS 2005). Within the ROI, Sequoyah County has experienced the highest average non-farm unemployment rate for the period (6.9 percent), with the highest rate occurring in 1998 (9.1 percent) (BLS 2005).

Median household income in 1999 ranged significantly within the ROI. The highest median household income in the ROI was \$31,125 in Mayes County, and the lowest median household income was \$24,881 in Adair County (USCB 2000b).

3.7.2.1.2 Farm Employment and Income

As reported by the *2002 Census of Agriculture* (USDA 2004), there were 4,769 farm workers on 1,298 worked farms within the ROI in 2002, accounting for a payroll of \$28.1 million. Table 14 lists the hired farm and contract labor costs per county within the ROI and labor costs as a percentage of total production costs. In 1997, the total hired farm and contract labor costs were \$23.3 million, which was 8.4 percent of total production costs. In 2002, the total hired farm and contract labor costs were \$30.5 million, which was 10.6 percent of total production costs.

Approximately three-fourths of farm cash receipts in Oklahoma are from livestock and livestock products, while crops account for the remaining one-fourth (USDA 2003). Oklahoma ranked third in the U.S. for both cattle production and winter wheat in 2002 (USDA 2003). The Bureau of Economic Analysis (BEA) (2005) reported a realized net farm income in excess of \$116 million within the ROI in 2002. This was a decrease of 45.3 percent as compared to the 1992 net farm income. BEA (2005) also reported that total government payments to farms within the ROI exceeded \$6.5 million in 2002, an increase of 400 percent from 1992. Farm wages and perquisites in 2002 in the ROI were approximately \$22.9 million, which was a 4.3 decrease from those in 1992. These costs were a significant contributor to the 48.0 percent reduction in net farm proprietors' income within the ROI from 1992.

Table 14. Hired farm and contract labor as a percentage of total production expenses for 1997 and 2002.

Area	2002				1997			
	Hired Farm Labor (\$1,000)	Contract Labor (\$1,000)	Total Production Expenses (\$1,000)	Labor as a Percent of Total Production Expenses	Hired Farm Labor (\$1,000)*	Contract Labor (\$1,000)*	Total Production Expenses (\$1,000)*	Labor as a Percent of Total Production Expenses
Oklahoma	237,162	38,838	4,069,112	6.8	191,754	29,679	3,784,514	5.9
Adair	1,760	460	62,595	3.5	1,686	404	62,186	3.4
Cherokee	20,333	355	63,871	32.4	14,933	322	55,998	27.2
Delaware	3,448	545	97,845	4.1	2,215	316	87,065	2.9
Mayes	1,240	408	41,486	4.0	1,287	148	30,217	4.7
Sequoyah	1,318	602	21,681	8.9	1,244	742	40,284	4.9
*Value in 2002 dollars Source: USDA 2004								

3.7.2.1.3 Farm Production Expenses and Returns

In 2002, farm production expenses exceeded \$287 million within the ROI. This was a decrease over the 1992 figure of \$325 million (adjusted to 2002 dollars) (USDA 2004, BEA 2005). Using the 2002 acreage in active farm production (1,265,241 acres), the average cost per acre within the ROI in 2002 was \$227.21 (USDA 2004). Using 2002 cropland, the cost per acre of agricultural chemicals inputs, including fertilizers and lime, was \$7.84 (USDA 2004). Average net cash return per farm within the ROI was \$14,389 in 2002 (USDA 2004). The average net cash receipts per acre within the ROI in 2002 were \$73.80 (USDA 2004). Table 15 lists the average farm production expenses and return per dollar of expenditure in 2002 for each county in the ROI. Table 16 lists the average value of land and buildings and the average value of machinery and equipment per farm in 2002 within each county in the ROI.

Table 15. Average farm production expenses and return per dollar of expenditure in 2002.

Area	Average Size of Farm (acres)	Average Total Farm Production Expense (\$)	Average Cost per Acre (\$)	Average Net Cash Return per Farm (\$)	Average Net Cash Return per Acre (\$)	Average Return per \$ Expenditure (\$)
Oklahoma	404	48,859	121	8,220	20	0.17
Adair	211	55,394	263	15,582	74	0.28
Cherokee	181	52,139	288	23,250	128	0.45
Delaware	203	70,190	346	23,646	116	0.34
Mayes	195	26,696	137	5,999	31	0.22
Sequoyah	177	17,221	97	3,468	20	0.20
Source: USDA 2004						

Table 16. Average value of land, buildings, machinery, and equipment per farm in 2002.

Area	Average Size of Farm (acres)	Average Value of Land and Buildings per Farm (\$)	Average Value of Machinery and Equipment per Farm (\$)
Oklahoma	404	285,730	42,155
Adair	211	240,360	35,214
Cherokee	181	229,729	29,573
Delaware	203	276,410	30,518
Mayes	195	254,562	35,960
Sequoyah	177	186,643	32,755
Source: USDA 2004			

3.7.2.1.4 Agricultural Land Use

In 2002, there were 1,265,241 acres of land in farms including cropland, woodland, pastureland and rangeland, and house lots, etc. This was a 10.6 percent decrease from 1997 (USDA 2004). Table 17 lists the acreage for different agricultural land uses in 1997 and 2002 and the percent change during that period.

In 1997, there were 1,024,267 acres in Oklahoma enrolled in either CRP or the Wetlands Reserve Program (WRP). Of that amount, 6,485 acres were located within the ROI. Five years later (in 2002), enrollment had increased statewide to 1,103,520 acres, while enrollment within the ROI decreased to 2,991 acres. As of December 2005, a total of 1,057,291 acres in Oklahoma were enrolled in CRP (FSA 2005). The average value of Oklahoma cropland in 2005 was estimated at \$745 per acre (USDA 2005).

Table 17. Agricultural land uses in 1997 to 2002 and the percent change experienced during that period.

Land Use	Acres in 1997	Acres in 2002	Percent Change
Cropland ¹	648,405	561,415	-13.4
Woodland ²	249,452	237,459	-4.8
Pastureland and rangeland ³	470,748	418,674	-11.1
House lots, ponds, roads, wasteland, etc.	46,231	47,693	3.2
CRP and WRP ^{4,5}	6,485	2,991	-53.9
Total Land in Farms ⁶	1,414,836	1,265,241	-10.6
¹ Cropland includes all harvested cropland, cropland used for pasture or grazing, and other cropland ² Woodland includes wooded pastureland and wooded non-pastureland ³ Pastureland and rangeland excludes cropland and wooded pastureland ⁴ Operations with land enrolled in CRP or WRP are counted as farms if they received \$1,000 or more in government payments. ⁵ Acreage from Sequoyah County withheld to avoid disclosing data for individual farms ⁶ Total land in farms includes the sum of cropland, woodland, pastureland and rangeland, and house lots, etc. Source: USDA 2004			

3.7.2.1.5 Recreation Spending

According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NSFHWAR), 838,000 State residents of ages 16 and older participated in hunting or fishing-related activities in Oklahoma in 2001. In that same year, approximately 1.1 million residents participated in some sort of wildlife viewing (e.g., observing, photographing, or feeding wildlife) (FWS and USCB 2001).

Oklahoma waters lured roughly 774,000 anglers to the State in 2001. Of that total, 84 percent were residents of Oklahoma and 16 percent were non-residents. Total fishing-related expenditures in 2001 were in the range of \$476 million from residents and non-residents. The NSFHWAR established that approximately \$212 million went to trip-related expenses, such as food, lodging, and transportation; while \$250 million went to equipment for the trip, such as rods, reels, and lines. The remaining \$14 million went to other related costs such as membership dues, stamps, permits, and licenses. The 2001 survey data indicated that fishing in Oklahoma decreased by approximately 150,000 anglers from 1996. The 2001 survey also showed that the most popular species among anglers were catfish and bullheads, followed by walleye, sauger, and various panfish (FWS and USCB 2001).

Resident and non-resident hunters totaled 261,000 in the 2001 survey. Residents accounted for 92 percent of those individuals, while non-residents accounted for 8 percent. Hunting-related expenditures amounted to \$284 million dollars for the State. Of that amount, \$97 million went to trip-related items, \$130 million went to equipment-related expenses, and \$57 million went to other expenditures such as membership dues and licenses. The NSFHWAR reported the number of hunters in Oklahoma decreased from 297,000 hunters in 1996 to 261,000 hunters in 2001. Of the hunters surveyed in 2001 to determine the preference of species hunted, 212,000 preferred big game species, 131,000 preferred small game species, and 81,000 preferred migratory bird hunting (some individuals hunted in more than one category) (FWS and USCB 2001).

According to the 2001 survey, wildlife viewing activities in Oklahoma were enjoyed by 1.1 million individuals. Wildlife-viewing includes non-consumptive activities such as photographing, feeding, or observing wildlife. These activities created revenue of \$193 million in Oklahoma in 2001. Trip-related expenses including transportation, food, and lodging amounted to approximately \$69 million; while equipment-related expenses, such as film, cameras, and binoculars, amounted to \$111 million. Donations, contributions, memberships, and other related expenses amounted to \$13 million. The 2001 survey indicated that the majority of wildlife-viewers leaving their home environment to observe wildlife went most often to woodlands, lakes, and streams (FWS and USCB 2001).

3.8 Environmental Justice

3.8.1 Description

Populations of special concern are identified and analyzed for environmental justice impacts. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Federal agencies:

“...make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations....” (59 FR 32, 1995)

Race and ethnicity are two distinct categories of minority populations. A minority population can be described by either category, or by a combination of the two. Race as defined by the U.S. Census Bureau (USCB) includes White, Black or African American, American Indian or Alaskan Native, Asian, and

Native Hawaiian or Other Pacific Islander (USCB 2001). Ethnicity is defined as either being of Hispanic or Latino origin and any race, or not of Hispanic or Latino origin and any race (USCB 2001). Hispanic or Latino origin is further defined as “a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race” (USCB 2001). A minority population can be described as being composed of a minority group and exceeding 50 percent of the population in an area, or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population (CEQ 1997a).

National poverty thresholds are measured in terms of household income and are dependent upon the number of persons within the household. Individuals falling below the poverty threshold are considered low-income individuals. USCB census tracts where at least 20 percent of the residents are considered poor are known as *poverty areas*. When the percentage of residents considered poor is greater than 40 percent, the census tract is considered an *extreme poverty area* (USCB 1995).

The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.8.2 Affected Environment

As reported by USCB for year 2000 (2000b), demographics for the non-Hispanic ROI population were 64.3 percent White, 0.8 percent Black or African American, 25.8 percent American Indian or Alaska Native, 0.2 percent Asian, less than 0.1 percent Native Hawaiian or Pacific Islander, and 8.8 percent all other races or combination of races. Hispanic or Latino of any race accounted for 2.6 percent of the population. The ROI is not a location of a concentrated minority population.

The average poverty rate for the ROI in 1999 was 19.7 percent and varied from a high of 23.2 percent in Adair County to a low of 14.3 percent in Mayes County (USCB 2000b). Because approximately 20 percent of the residents are considered poor, the ROI is considered to be a poverty area.

In 2002, American Indians or Alaskan Natives operated 1,281 farms within the ROI; Spanish, Hispanic, or Latino persons operated 137 farms; Blacks or African Americans operated 23 farms; Asians operated 11 farms; Native Hawaiians or Pacific Islanders operated 6 farms; and 298 farms were operated by persons reporting more than one race (USDA 2004). The ROI accounts for 16.1 percent of all minority farm operators within the State of Oklahoma, while these 1,756 farms account for 26.8 percent of the total number of farms within the ROI (USDA 2004).

3.9 Wild and Scenic Rivers

3.9.1 Description

The *Wild and Scenic Rivers Act* established the Wild and Scenic Rivers System to protect rivers that:

“...with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.” (16 USC 28 parts 1271–1287, 1968)

The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.9.2 Affected Environment

There are currently no federally designated wild and scenic rivers within the ROI; however, the Illinois River and its two major tributaries, Baron Fork and Flint Creek, are being studied for inclusion in the National Wild and Scenic Rivers System (Oklahoma Scenic Rivers Commission [OSRC] 1999). In the meantime, Oklahoma legislators have designated six rivers in Oklahoma as scenic rivers. These are the Illinois River, Baron Fork, Flint Creek, Upper Mountain Fork River, Lee Creek, and Little Lee Creek. The Illinois River, Baron Fork, and Flint Creek are in the ROI. These rivers, designated and protected by the *Oklahoma Scenic Rivers Act*, possess unique beauty and resources that provide present and future benefit to the people of the State (82 *Oklahoma Statutes* 21 part 1452, 1970).

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences or impacts to resources described in Chapter 3 that may result from implementing the preferred alternative or no action alternative. As this analysis is programmatic and not site specific, resource impacts may not always be quantifiable. In compliance with guidelines contained in NEPA and CEQ regulations, each individual CREP agreement would require a site specific environmental evaluation to be completed by FSA.

4.1 Biological Resources

4.1.1 Wildlife and Fisheries

4.1.1.1 Level of Impact

Significant impacts to wildlife and fisheries would include those actions that resulted in harming, harassing, or reducing those populations to the point they become imperiled or populations of concern, or reducing or adversely altering their habitat.

4.1.1.2 Alternative A—Preferred

Implementation of the preferred alternative would result in long-term, beneficial impacts to both wildlife and fisheries throughout the ROI. Current and historical agricultural practices have limited some of these species, and displaced others from their historical range. By removing portions of land from agricultural production, planting filter strips and riparian forest buffers, and limiting livestock access to riparian floodplains, the proposed CPs would increase the quality and abundance of wildlife and fisheries habitat.

4.1.1.2.1 Wildlife

Wildlife habitat would be restored or enhanced by implementing the proposed CPs. This would result in a beneficial impact to terrestrial and avian wildlife species that frequent the ROI. Establishing filter strips (CP21) would create narrow bands of grasses that would be suitable habitat for ground nesting bird species. Filter strips would provide thermal and nesting cover for ground nesting species, as well as foraging areas for grazing wildlife. Filter strips would also provide nectar and pollination areas for insects. Bermuda and fescue grass may be planted with native species within filter strip areas to create vegetative diversity. Filter strips may require mowing to stimulate vegetative growth. Mowing should take place before or after the nesting time for ground nesting birds, which varies among species.

Establishment of riparian forest buffers (CP22) would significantly benefit terrestrial and avian wildlife within the ROI. Riparian forest buffers would create corridors for wildlife to travel between different habitat types. These travel corridors would also be used for daily and seasonal migration. Riparian forest buffers representing bottomland hardwood forest species would be extremely beneficial to migratory birds, which use these areas for breeding grounds, wintering, and feeding (Anderson and Masters 2004). Hard and soft mast produced in these buffers would provide food, as well as covered feeding areas, for game species such as turkeys, white-tail deer, and squirrels. Riparian forest buffers may be attached to pre-existing vegetation, such as windbreaks or shelterbelts. By attaching buffers to existing vegetation, habitat area would be maximized and fragmentation reduced.

The encroachment of woody vegetation on grasslands has been found to increase predation and brood parasitism on non-game neotropical migrant grassland nesting species. Therefore, woody vegetation such as that in riparian forest buffers should not be planted in grasslands that currently do not contain woody vegetation.

As buffers mature, periodic harvesting of some trees may be necessary. Such harvests may temporarily disrupt daily migration patterns of resident wildlife. The use of best management practices (BMPs) would help ensure these impacts would be minor and temporary.

4.1.1.2.2 Fisheries

Implementation of the proposed CPs would restore and enhance aquatic species habitat as well as improve overall water quality. Establishing filter strips would reduce the amount of sediment, nutrients, and pesticides entering waters (NRCS 2000). Pollutants would be taken up by the vegetation comprising the filter strip, while sediment would settle to the bottom of the strips rather than into water sources. A major impairment to waters within the ROI is turbidity (EPA 2002a). Turbidity, a measure of water clarity, is directly affected by the amount of sedimentation suspended within the waterway. Within slow moving waterways, the settling of sediment can interfere with the feeding and reproduction of some fish. Sedimentation can also limit the hatch of aquatic insects, which are a major component of the food chain (Anderson and Masters 2004). High turbidity can also increase water temperature, which is unfavorable to some aquatic species. Filter strips adjacent to waterways would decrease the amount of sedimentation entering the water; thereby decreasing turbidity. Filter strips would also reduce phosphorus loading by limiting the amount of nutrients entering waterways. An excess of phosphorus, a major impairment to some waterways within the ROI, can cause algae blooms that deplete the waters of dissolved oxygen content (EPA 2002a, NRCS 1994).

Riparian forest buffers would establish woody and non-woody vegetation around water sources within the ROI. Once fully mature, this vegetation would fall over and into waterways and create fish habitat. In small streams, up to 75 percent of the organic food base within the water is provided by detritus, including limbs, leaves, fruit, and insects falling from overhanging branches (Welsch 1991). Downed trees within waterways provide cover areas and create pools, riffles, and gravel beds for spawning areas. Buffer vegetation would filter nutrients and pesticides before they reach the waterways, as well as stabilize stream banks which would limit sedimentation.

4.1.1.3 Alternative B—No Action

Under the no action alternative, lands eligible for CREP enrollment would remain in agricultural production. Wildlife and fisheries habitat would continue to decline in quality and become more fragmented, and impaired waterways within the ROI would be likely to remain as such. Terrestrial, avian, and aquatic species would continue to be exposed to harmful pathogens and poor water quality.

4.1.2 Vegetation

4.1.2.1 Level of Impact

Significant impacts to vegetation would include those actions that resulted in removing or choking out unique or imperiled vegetation, or introducing vegetation that is invasive.

4.1.2.2 Alternative A—Preferred

The preferred alternative would enhance vegetation by establishing CPs, resulting in a beneficial impact to vegetation within the ROI. Vegetation within the ROI has been altered and depleted due to farming, logging, and overgrazing. Filter strips (CP21) would create narrow bands of native vegetation as well as fescue and Bermuda grasses which, although not native to the State, are not invasive. Filter strips would be placed adjacent to streams, ponds, lakes, wetlands, water-filled ditches, groundwater recharge areas, and sinkholes (FSA 2003b).

Riparian forest buffers (CP22) would enhance shrubs, trees, and grasses adjacent to riparian areas. This vegetation would be planted adjacent to perennial or intermittent streams, lakes, wetlands, ponds, seeps, and areas of groundwater recharge (FSA 2003b). Native plants species would be used in the riparian buffers, thus enhancing present vegetation within the ROI. Zone three of the riparian buffer (filter strip area) may also be planted with fescue and Bermuda grasses.

Some herbicides may be used during implementation of the CPs. Herbicides would be pre-approved by the governing Federal agency of the specific site and applied strictly according to label directions to minimize the threat to biological resources within the area.

4.1.2.3 Alternative B—No Action

Under the no action alternative, lands eligible for CREP enrollment would remain in agricultural production. Proposed CPs would not be implemented and native vegetation would continue to be removed for agricultural purposes.

4.1.3 Protected Species and Habitat

4.1.3.1 Level of Impact

Significant impacts to protected species and habitat would include any action that resulted in the harassment or loss of threatened, endangered, or candidate species their defined habitat.

4.1.3.2 Alternative A—Preferred

Nine of the ten protected species in the ROI rely on riparian areas for some sort of habitat. Of the ten species, there would be a beneficial impact to six and a potential adverse impact to two resulting from implementation of the preferred alternative. The remaining two species would either be unaffected or may benefit slightly.

The proposed CPs would benefit Ozark cavefish, Arkansas darter, and Neosho mucket. Ozark cavefish and Neosho mucket populations have been limited due to water quality degradation, and filter strips and riparian forest buffers would improve water quality within the ROI. These CPs would also decrease sedimentation within waterways and improve water clarity. Sedimentation has caused high turbidity impairments within the Illinois River, where populations of Neosho muckets are found. In addition, these species would profit from cooler water temperature due to the shade provided by the overhanging vegetation of mature riparian forest buffers.

Installation of riparian forest buffers would benefit gray bats, Indiana bats, and bald eagles. Gray bats and Indiana bats require riparian areas for foraging habitats. Indiana bats forage more on aquatic insects than terrestrial ones, and feed around mature trees that overhang waterways for protection. Riparian forest buffers would provide habitat for the bald eagle, which primarily feeds in riparian ecosystems, and mature woody vegetation would offer perching and nesting sites.

Piping plover and least interior tern habitat consists of bare or sparsely vegetated banks of rivers and lakes, thus implementation of the proposed CPs may have an adverse impact to these species. Even if riparian forest buffers are not installed directly within piping plover and least interior tern habitat, buffers in the habitat vicinity may create an influx of avian and terrestrial predators. Therefore, areas that are certain to support piping plover or least interior tern populations should not be planted with riparian forest buffer vegetation.

The preferred alternative is unlikely to impact the American burying beetle as their habitat is based primarily on the availability of carrion. However, precautions should be taken to ensure that the burying beetle is not present prior to CP implementation.

Ozark big-eared bats would be mostly unaffected by the proposed CPs, but may benefit slightly when the riparian forest buffers are mature. These bats occupy edge areas between grasslands and forest areas to feed, and they may utilize the edge created by the forest buffers if other habitat requirements are met nearby.

To comply with the requirements of Section 7 of the *Endangered Species Act* (16 USC 35 parts 1531 et seq., 1988), FSA would ensure that all conservation plans consider whether threatened, endangered, or candidate species or critical habitat are present within each specific site. FSA must also consult with the appropriate FWS staff on a programmatic level to determine what level of site specific review may be necessary.

4.1.3.3 Alternative B—No Action

Under the no action alternative, the degradation of vegetation, wildlife habitat, and aquatic habitat would continue. Habitat would decline in quality and become more fragmented, and impaired waterways within the ROI would be likely to remain as such. Protected species would continue to be exposed to harmful pathogens and poor water quality.

4.2 Cultural Resources

4.2.1 Archaeological Resources

4.2.1.1 Level of Impact

Significant impacts to archaeological resources would include those actions which resulted in: 1) directly or indirectly altering the characteristics of the property that qualify it as a historic cultural resource; 2) causing destruction or damage to the property; 3) removing parts or all of the property from its historic location; 4) introducing any permanent atmospheric, audible, or visual elements that diminish the integrity of the historic property; 5) the neglect of a registered property; or 6) the disturbance of important religious sites or sites of cultural significance to American Indians.

4.2.1.2 Alternative A—Preferred

There is the potential that archaeological resources would be encountered during implementation of the preferred alternative. Activities that require any excavation to accomplish tasks associated with CP installation may have impacts to recorded and unidentified archaeological resources.

As the Oklahoma CREP agreement does not address specific sites, detailed cultural resources information can not be offered in this PEA. All actions would be reviewed with OSHPO during the planning and implementation phases of the proposed action. When specific sites to be enrolled in CREP are identified by legal description, a Class I literature search, as appropriate, would be conducted on these properties to determine if further investigation or mitigation would be warranted.

4.2.1.3 Alternative B—No Action

Under the no action alternative, agricultural practices that occur on lands within the ROI would continue. Though the continuation of farming and other agricultural practices on previously disturbed land would not be expected to impact archaeological resources, any change in these activities that would disturb previously intact areas may result in impacts to known or unidentified archaeological properties.

4.2.2 Architectural Resources

4.2.2.1 Level of Impact

Significant impacts to architectural resources would include those actions which resulted in: 1) directly or indirectly altering the characteristics of the property that qualify it as a historic cultural resource; 2) causing destruction or damage to the property; 3) removing parts or all of the property from its historic location; 4) introducing any permanent atmospheric, audible, or visual elements that diminish the integrity of the historic property; 5) the neglect of a registered property; or 6) the disturbance of important religious sites or sites of cultural significance to American Indians.

4.2.2.2 Alternative A—Preferred

There is the potential that architectural properties would be encountered during implementation of the preferred alternative. Activities associated with CP installation may have impacts to recorded and unidentified architectural resources.

As the Oklahoma CREP agreement does not address specific sites, detailed cultural resources information can not be offered in this PEA. All actions would be reviewed with OSHPO during the planning and implementation phases of the proposed action. When specific sites to be enrolled in CREP are identified by legal description, a Class I literature search, as appropriate, would be conducted on these properties to determine if further investigation or mitigation would be warranted.

4.2.2.3 Alternative B—No Action

Under the no action alternative, agricultural practices that occur on lands within the ROI would continue. Though the continuation of farming and other agricultural practices on previously disturbed land would not be expected to impact archaeological resources, any change in these activities that would disturb previously intact areas may result in impacts to known or unidentified archaeological properties.

4.2.3 Traditional Cultural Properties

4.2.3.1 Level of Impact

Significant impacts to TCPs would include those actions which resulted in: 1) directly or indirectly altering the characteristics of the property that qualify it as a historic cultural resource; 2) causing destruction or damage to the property; 3) removing parts or all of the property from its historic location; 4) introducing any permanent atmospheric, audible, or visual elements that diminish the integrity of the historic property; 5) the neglect of a registered property; or 6) the disturbance of important religious sites or sites of cultural significance to American Indians.

4.2.3.2 Alternative A—Preferred

There is the potential that TCPs would be encountered during implementation of the preferred alternative. Activities associated with CP installation may have impacts to recorded and unidentified TCPs.

As the Oklahoma CREP agreement does not address specific sites, detailed cultural resources information can not be offered in this PEA. All actions would be reviewed with OSHPO during the planning and implementation phases of the proposed action. When specific sites to be enrolled in CREP are identified by legal description, a Class I literature search, as appropriate, would be conducted on these properties to determine if further investigation or mitigation would be warranted.

4.2.3.3 Alternative B—No Action

Under the no action alternative, agricultural practices that occur on lands within the ROI would continue. Though the continuation of farming and other agricultural practices on previously disturbed land would not be expected to impact TCPs, any change in these activities that would disturb previously intact areas may result in impacts to known or unidentified TCPs.

4.3 Water Resources

4.3.1 Surface Water

4.3.1.1 Level of Impact

Significant impacts to surface water would include those actions that permanently increase runoff or pollutants entering rivers, streams, or lakes; adversely change water supply or storage; or cause violations of State or Federal laws or regulations.

4.3.1.2 Alternative A—Preferred

Implementation of the preferred alternative would have a long-term beneficial effect on surface water quality throughout the ROI. Filter strips established on areas adjacent to water resources would reduce the runoff of sediments, nutrients, pesticides, and other contaminants by slowing the velocity of runoff. A decrease in velocity would allow sediments to settle and soluble pollutants to be taken up by vegetation before reaching waterbodies. Research indicates that filter strips can reduce sediment loading by 56–95 percent (Leeds, Brown, Sulc, and VanLieshout 1994). Filter strip efficiency depends on rainfall, runoff conditions, soil characteristics, slope, width of the filter strip, and the species of vegetation planted.

Removing land from agricultural production would reduce erosion and sedimentation of waterways because there would be less tillage to produce crops. Less sediment entering the waterways would reduce turbidity, a major impairment to some waters within the ROI. Reduced turbidity would allow aquatic vegetation to persist, and this may increase the dissolved oxygen content within the water. Low dissolved oxygen content is another impairment of waterways within the ROI.

Though filter strips are more efficient at trapping sediment than soluble nutrients, they will trap sediment-bound nutrients, such as phosphorus and ammonium, with some efficiency (Leeds et al. 1994). Removing phosphorus and nitrogen from water sources reduces algae blooms that deplete the oxygen content in surface water.

The implementation of riparian forest buffers would improve water quality throughout the ROI by reducing the effects of pollution, nutrients, and sedimentation runoff. Phosphorus loading would be reduced, and the shade provided by overhanging vegetation would cool water temperatures and increase the capability of the water to retain dissolved oxygen. Decreasing sedimentation would reduce the chance of flooding. Large deposits of sediments can build up the floor of waterways and reduce the amount of water that can be held, which greatly increases the potential for flooding in high risk flooding areas (Welsch 1991).

Installation of CPs may involve the clearing of vegetation and some soil disturbance. These activities may result in high levels of sediment runoff, resulting in temporary adverse impacts to surface water quality. The use of filter fencing or similar mitigation practices and compliance with local and State regulatory requirements, such as obtaining stormwater pollution permits for construction sites over 1 acre, would reduce these impacts (ODEQ 2002b).

4.3.1.3 Alternative B—No Action

Under the no action alternative, rivers, streams, and lakes throughout the ROI would continue to be subject to impairments such as high nutrient loading, turbidity, low dissolved oxygen content, high sedimentation levels, and the presence of pathogens.

4.3.2 Groundwater

4.3.2.1 Level of Impact

Significant impacts to groundwater would include those actions that permanently increase pollutants entering groundwater; adversely change water supply or storage; or cause violations of State or Federal laws or regulations.

4.3.2.2 Alternative A—Preferred

Groundwater resources within the ROI would benefit from the preferred alternative. Groundwater is directly connected to surface water, and much of the groundwater contamination throughout the U.S. is connected to surface water contamination (Welsch 1991). Therefore, reducing contaminants in surface water may have a beneficial effect on the groundwater with which it is connected. In addition, vegetation within the filter strips and riparian forest buffers would slow the rate of rainwater flow over the ground, creating greater rates of aquifer recharge.

4.3.2.3 Alternative B—No Action

Under the no action alternative, groundwater resources in the ROI would continue to be subject many of the same impairments as those of surface waters including high levels of nutrients and the presence of pathogens. Rates of groundwater recharge may decrease over time if vegetation is removed due to expanding agricultural practices.

4.3.3 Wetlands

4.3.3.1 Level of Impact

Significant impacts to wetlands would include those actions that permanently diminish or degrade wetland resources.

4.3.3.2 Alternative A—Preferred

Implementation of the preferred alternative may have a beneficial effect on any wetlands located adjacent to lands enrolled in CREP. Wetlands rely on groundwater flow for seasonal recharge. By reducing the amount of pollutants and sediments entering surface water and groundwater in the ROI, there would be a beneficial effect on the water quality of adjacent wetlands.

The removal of some land from agricultural use may affect the number and size of wetlands formed by anthropogenic features associated with agricultural activities such as reservoirs and drainage channels; however, this effect is expected to be minor.

4.3.3.3 Alternative B—No Action

Under the no action alternative, wetlands in the ROI would continue to be subject to high sedimentation levels, excess nutrients, and the presence of pathogens.

4.3.4 Floodplains

4.3.4.1 Level of Impact

Significant impacts to floodplains would include those actions that cause destruction to or reduce the function of floodplains.

4.3.4.2 Alternative A—Preferred

The preferred alternative would have a minor beneficial effect on floodplains. Restricting livestock access to floodplains would decrease stream bank erosion and improve overall function of the floodplains.

4.3.4.3 Alternative B—No Action

Under the no action alternative, livestock access to floodplains, and the resulting overland flow of pathogens to streams and stream bank erosion, would remain unchanged.

4.4 Soil Resources

4.4.1 Level of Impact

Significant impacts to earth resources would include those actions that erode or diminish unique topographical features or soil types, permanently increase erosion and sedimentation, or alter or destroy paleontological resources.

4.4.2 Alternative A—Preferred

Long-term beneficial impacts to topography and soils are expected to occur under Alternative A. Implementation of the proposed CPs would result in localized stabilization of soils and topography as a result of decreased erosion and runoff. Limiting livestock access to floodplains would reduce stream bank destabilization, resulting in reduced rates of erosion. Establishing permanent vegetation on former croplands would reduce erosion by wind and water.

Short-term disturbances to soils during implementation of CPs may include tilling or installation of various structures such as fences, breakwaters, and roads. These activities may result in temporary increases in soil erosion. Although managed haying may be conducted on enrolled CREP lands, the amount of land used for these activities is unlikely to change from current conditions. There would be negligible effects to paleontological resources.

4.4.3 Alternative B—No Action

Under the no action alternative, the current rates of erosion and the changes in topography resulting from erosion would continue. There would be negligible effects to paleontological resources.

4.5 Air

4.5.1 Level of Impact

Significant impacts to air quality would include those actions that: 1) cause or contribute to a violation of any national, State, or local ambient air quality standard; 2) expose sensitive receptors (e.g., residential areas, hospitals, daycare facilities, elder care facilities, elementary schools, parks, and outdoor restaurants) to substantially increase pollutant concentrations; or 3) cause emissions which exceed any significant criteria established by the State Implementation Plan.

4.5.2 Alternative A—Preferred

Implementation of Alternative A would result in the establishment of filter strips and riparian buffers. These CPs would minimize the amount of exposed soil, which would have a beneficial impact to local air quality. Oklahoma has relatively clean air and it is not expected that implementing either of the proposed CPs would result in significant impacts to air quality.

CPs may also enhance carbon sequestration, which is the storage of carbon in its stable form. The planting of new vegetation would remove and sequester carbon dioxide from the atmosphere and help reduce greenhouse gases.

Implementation the proposed CPs may include activities such as tilling, burning, and installation of various structures. These activities may temporarily impact local air quality. Tilling may temporarily increase particulate matter in the immediate area. This can be mitigated by watering exposed soil before and after work. Despite the temporary increase in particulate matter, effects to air quality due to implementation of the proposed CPs would not be significant nor long term.

Installing various structures such as roads, firebreaks, and fences may require the temporary use of heavy-duty diesel construction vehicles. Primary emissions from construction vehicles include carbon monoxide and some particulate matter. BMPs would be used during construction activities to reduce the amount of emissions.

Prescribed open burning would release pollutants into the environment such as particulates, partially consumed fuel, liquid droplets, carbon monoxide, hydrocarbons, and nitrogen oxides. The quantity and distribution of these pollutants would depend on the type of vegetation that is being burned, the configuration of the burned material (material heaped or organized in rows), and the weather at the time of burning. Moderate prescribed burning would not likely have a significant impact to local air quality.

4.5.3 Alternative B—No Action

Under the no action alternative, existing air quality conditions would not change.

4.6 Recreation

4.6.1 Level of Impact

Significant impacts to recreational resources would include those actions that drastically change the quantity of lands used for public recreation, or that degrade any aspect of these lands such as aesthetics, fisheries, wildlife, or water quality.

4.6.2 Alternative A—Preferred

Implementing the preferred action would result in a long-term beneficial impact to recreation resources within the ROI. Creating or enhancing quality wildlife habitat would increase the abundance of species frequenting the ROI and provide more successful opportunities for hunting and wildlife viewing. The proposed CPs would promote good water quality, which would support more abundant and healthier fish populations in the ROI as well as downstream. This would result in increased fishing opportunities.

The growth in hunting, wildlife viewing, and fishing opportunities may increase monies received from the purchase of licenses and from other recreational spending, potentially improving socioeconomic conditions in the area (see Section 4.7, *Socioeconomics*). Implementation of the proposed CPs would increase the desirability of land to be used for non-consumptive outdoor activities such as swimming, boating, and camping due to improved aesthetics.

Construction activities associated with CP implementation may temporarily displace some wildlife species. These activities may also temporarily increase sedimentation entering waterways, which would have an adverse impact to some fish species and water-related recreation. The adverse impacts associated with construction activities would be temporary and minimized using BMPs.

4.6.3 Alternative B—No Action

Under the no action alternative, the current condition of water and lands used by the public for recreation would remain unchanged.

4.7 Socioeconomics

4.7.1 Level of Impact

Significant impacts to socioeconomics would include those activities which may induce changes in population density, growth rate, or patterns of land use.

4.7.2 Alternative A—Preferred

Implementation of the preferred alternative would result in a maximum of 19,035 acres of land being conserved for a 15-year period. This would result in a positive net present value for the land rentals.

This action would result in a maximum loss of 19,035 acres of agricultural land. In 2002, there were 4,769 farm workers on the 1,265,241 acres of farms within the ROI, accounting for a payroll of \$28.1 million (USDA 2004). Removing 19,035 acres from agricultural production would decrease the land in farms to 1,246,206 acres and may result in the loss of 72 farm worker positions at an estimated cost of \$424,225 per year when all 19,035 acres are under contract. The loss of these positions would account for approximately 1.5 percent of the farm worker positions available in 2002. The loss of production on 19,035 acres would reduce the amount of total farm production expenditures, less hired and contract labor, by \$3.87 million per year, or 1.3 percent of the total 2002 farm production expenditures (USDA 2004).

Based on average Oklahoma rental rates, CREP enrollment is estimated at an average of \$73.50 per acre for the 19,035 acres proposed (Appendix A). In addition, a maintenance payment of \$10.00 per acre and a maintenance fee for riparian buffers in the amount of 20 percent of the rental payment would be provided to participants for an estimated average of \$98.20 per acre per year. Participants would receive a one-time signing incentive fee of \$150.00. OCC and FSA would cost share with producers for up to 83 percent of the eligible reimbursable costs of all approved CPs, and FSA would also issue a practice incentive payment equal to 40 percent of the CP establishment costs. On average, this establishment cost is anticipated to be \$1,156 per acre. The total net present value is \$22.0 million over 15 years (Appendix F).

Hines, Sommer, and Petrulis (1991) noted that enrolling lands into CRP adversely affected agricultural-based industries such as transportation and processing. The replacement of expenditures that would have supported local agriculture-related industries with CRP payments is often spent on other commodities within the local community. Impacts are generally greater where agriculture is the dominant economic activity and CRP enrollment is high.

Feather, Hellerstein, and Hansen (1999) reported non-market benefits associated with the implementation of CRP. For annual consumer surplus in Oklahoma, these would include an estimated \$12.14 per acre for wildlife viewing and \$0.29 per acre for freshwater recreation activities for a total consumer surplus per acre from CRP of \$12.43. Total annual consumer surplus attributable to CRP for the U.S. equated to \$13.45 or about twice that of the consumer surplus generated by CRP activities in

the Southern Plains Region, which includes Oklahoma. It is expected that the proposed CPs would improve wildlife and fisheries habitat, which in turn may improve hunting, fishing, and wildlife viewing opportunities in the ROI. These increased opportunities may generate recreation-related economic activity within and around the ROI.

4.7.3 Alternative B—No Action

Under the no action alternative, CREP would not be implemented and socioeconomic conditions would continue to follow the trends associated with the ROI, Oklahoma, and Southern Plains Region of the U.S.

4.8 Environmental Justice

4.8.1 Level of Impact

Significant impacts to environmental justice would include those activities in which low income or minority populations are adversely affected or unfairly compensated, or all affected individuals are not allowed equal access to the decision making process.

4.8.1.1 Alternative A—Preferred

The ROI would be considered a poverty area because approximately 20 percent of the residents fall below the poverty threshold. The preferred alternative would remove up to 19,035 acres from agricultural production. Extrapolating from the total number of farm workers per total acres in Oklahoma, the removal of 19,035 acres may result in the loss of 72 farm workers. It is likely that these 72 farm workers are included in the low-income population of the ROI.

The preferred alternative is expected to generate other non-farm employment activities within the ROI. For example, the initial installation of CPs may create temporary jobs. CP maintenance activities required over the life of each CREP contract may also create positions that would take the place of those lost when lands are removed from production.

Research has shown that CRP rental payments are often spent on other commodities within the local community, replacing the farm expenditures that are lost when land is removed from production for CRP (Hines, Sommer, and Petrulis 1991). Therefore, CREP payments are anticipated to create additional non-farm employment within the community.

Under NEPA, the identification of a low income or minority population does not preclude the proposed action from going forward. It does, however, compel Federal agencies to pay special attention to mitigation strategies, monitoring needs, and preferences expressed by the affected population.

4.8.1.2 Alternative B—No Action

There would be no impacts to minority populations or low-income populations under the no action alternative.

4.9 Wild and Scenic Rivers

4.9.1 Level of Impact

Significant impacts to wild and scenic rivers would include those activities that alter, degrade, or diminish any river within the National Wild and Scenic Rivers System. Although no such rivers are present within the ROI, there are three State-designated scenic rivers in the ROI.

4.9.2 Alternative A—Preferred

Implementation of the preferred action would have a long-term beneficial effect on surface water quality throughout the ROI as detailed in Section 4.3.1., *Surface Water*. This includes the scenic rivers protected by the *Oklahoma Scenic Rivers Act* (82 *Oklahoma Statutes* 21 part 1452, 1970), which are the Illinois River, Baron Fork, and Flint Creek in the ROI. In addition, implementation of the preferred action would prevent construction of buildings on lands enrolled in CREP for the term of the contract.

Installation of CPs may involve the clearing of vegetation and some soil disturbance. These activities may result in high levels of sediment runoff, resulting in temporary adverse impacts to the water quality of the scenic rivers. The use of temporary filter fencing or similar mitigation practices would reduce these potential impacts.

4.9.3 Alternative B—No Action

Under the no action alternative, the scenic rivers in the ROI would continue to be subject to impairments such as high phosphorus loading, turbidity, low dissolved oxygen content, high sedimentation levels, and the presence of pathogens.

5.0 CUMULATIVE EFFECTS

5.1 Introduction

As defined by CEQ regulations:

“Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (‘Federal or non-Federal’) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.” (40 CFR 30 part 1508.7, 2005)

CEQ guidance suggests that the first steps in assessing cumulative impacts involve defining the scope of the proposed action and other actions, and evaluating the nature of potential interactions between the actions (CEQ 1997b). Scope must consider geographic and temporal relationships between the proposed action and other actions. Actions overlapping with or in proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide even partially in time would tend to offer a higher potential for cumulative effects.

For the purpose of this analysis, the ROI includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3. The primary sources of information used to identify reasonably foreseeable future actions are public documents prepared by Federal, State, and local government agencies.

5.2 Past, Present, and Reasonably Foreseeable Actions

The Oklahoma NRCS manages the implementation of several programs that are focused on conserving and enhancing natural resources within the State. These programs are summarized in the following subsections to demonstrate the types of past, present, and reasonably foreseeable future actions that may occur in the ROI.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) provides technical, financial, and educational assistance for farmers and ranchers to address natural resources concerns on their private working lands. EQIP promotes agricultural production and environmental quality as compatible national goals and provides up to 75 percent cost-share assistance of certain CPs. Oklahoma received over \$7.5 million in 2002 from NRCS for EQIP; however, funding has not kept pace with requests for cost-share assistance (NRCS 2006).

Farm and Ranch Land Protection Program

The Farm and Ranch Land Protection Program (FRPP) (formerly the Farmland Protection Program) is a voluntary program that aids farmers in keeping their lands in agricultural production (NRCS 2006). This program provides matching funds to local, tribal, or State government entities and some non-governmental organizations with existing farm and ranch land protection programs to purchase conservation easements. A minimum of 30 years is required to be qualified for an easement; however, priority is given to applications with perpetual easements. Landowners involved with this program agree not to convert their land to non-agricultural uses, and to implement a conservation plan for any highly erodible land.

Grassland Reserve Program

The Grassland Reserve Program (GRP) is a voluntary program that allows landowners to restore rangeland, pastureland, shrubland, and some other lands to grassland, while retaining these areas as grazing lands (NRCS 2006). GRP emphasizes support for grazing operations, plant and animal biodiversity, and grasslands most vulnerable to conversion to cropland, urban development, or other uses.

Healthy Forests Reserve Program

The Healthy Forests Reserve Program (HFRP) is a voluntary program that aides in restoring and enhancing forest ecosystems to improve biodiversity, promoting the survival and persistence of protected species, and enhancing carbon sequestration (NRCS 2006). This program is authorized to be carried out until 2008. Eligible lands must be privately owned and have the potential to host protected species or their habitat, improve biological diversity, or increase carbon sequestration.

Soil and Water Conservation Assistance Program

The Soil and Water Conservation Assistance Program (SWCAP) is a voluntary program that provides incentive payments and cost-share payments to ranchers and farmers who actively address threats to water, soil, and other resources such as grazing lands, wildlife habitat, and wetlands (NRCS 2006). Eligible lands must be owned or controlled by the land owner and may be enrolled in 5 to 10 year contracts.

Wetlands Reserve Program

WRP is a voluntary program that provides financial and technical assistance to landowners who are actively addressing wetland, soil, water, wildlife habitat, and related issues. This program enrolls eligible lands in 30-year easements or cost-share agreements. As of 2001, there were a total of 122 contracts in Oklahoma encompassing over 28,171 acres (NRCS 2006).

Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) is a cost-share program that assists landowners in developing and improving wildlife habitat on their private lands (NRCS 2006). Plans are established with the help of NRCS and local conservation districts to fulfill the landowner's goals for improving wildlife habitat. Eligible land must be owned or controlled by the landowner, and may not enrolled in other specified programs.

5.3 Cumulative Effects Matrix

When considered in combination with other past, present, and reasonably foreseeable future actions, the incremental impact of the proposed action is expected to result in net beneficial impacts to biological resources, water resources, soil resources, and recreation in the watersheds proposed for CREP enrollment and in waters downstream (Table 18). No adverse cumulative impacts to any other resource discussed in Chapter 3.0 are expected.

Table 18. Cumulative effects matrix.

Resource	USDA Programs: EQIP, FRPP, GRP, HFRP, SWCAP, WRP, and WHIP	Cumulative Effects when combined with the Proposed Action
Biological Resources	The majority of these programs incorporate practices that provide restoration and enhancement of wildlife and fisheries habitat, vegetation, and water quality in their overall goals. These programs provide long-term beneficial impacts to biological resources.	The proposed action would enhance and restore wildlife and fisheries habitat and vegetation within the ROI. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit wildlife and fisheries, vegetation, and protected species.
Cultural Resources	There is potential for cultural resources to be impacted when these programs are initiated on previously undisturbed ground. OSHPO review, as appropriate, of all proposed actions prior to implementation helps to ensure that cultural resources are protected and preserved.	The proposed action has the potential to impact cultural resources. Consultation with OSHPO would be conducted prior to implementation activities to ensure cultural resources are not adversely impacted. Because the proposed action and USDA programs both require OSHPO consultation, no cumulative impacts to cultural resources would be expected.
Water Resources	Several of these programs are designed to improve water resources by planting shrubs, trees, and grasses in riparian areas and on floodplains to reduce pollution runoff to surface water and to allow for greater rates of groundwater recharge. WRP specifically restores and enhances degraded wetlands. These programs contribute long-term beneficial impacts to water quality.	The focus of the proposed action is on improving water quality in the ROI. The amount of pollutants and sediments entering waterways would be reduced by planting grasses, trees and shrubs. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit water resources.
Soil Resources	The majority of these programs establish vegetation on erodible lands as a practice to achieve their overall goal. This increases soil stability and reduces erosion, and has a long-term beneficial impact to soil resources.	Implementation of the proposed action would involve planting permanent vegetation, which would benefit local soil resources. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit soil resources.
Air	The programs which restore and enhance vegetation and reduce local soil erosion may indirectly improve air quality.	Vegetation planted under the proposed action would reduce local soil erosion and may also improve air quality, although to what extent can not be quantified. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit air quality. Oklahoma already has air quality that meets or exceeds Federal and State standards.
Recreation	These programs are implemented on private lands, so benefits to areas used by the public for recreation are limited. However, there may be slight benefits to this resource in the form of improved	The proposed action would be implemented on private lands, but may also benefit wildlife and fisheries habitat and aesthetics on nearby public lands. When combined, the proposed action

Resource	USDA Programs: EQIP, FRPP, GRP, HFRP, SWCAP, WRP, and WHIP	Cumulative Effects when combined with the Proposed Action
	wildlife and fisheries habitat, which may result in increased hunting, wildlife viewing, and fishing opportunities on nearby public lands. Improved aesthetics would also benefit recreation.	and USDA programs may result in cumulative impacts that benefit recreation.
Socioeconomics	The majority of these programs provide incentives focused on providing for more environmentally-sound farming and land use practices. The implementation of the conservation practices and expenditure of the incentives produce positive economic benefits, in addition to the economic benefits resulting from more environmentally-sound farming and land use practices.	The proposed action would provide incentives, rental payments, and maintenance fees which may offset some farm job losses. When combined with other USDA programs, the cumulative impact is expected to be negligible.
Environmental Justice	The majority of these programs provide incentives and/or education opportunities focused on providing for more environmentally-sound farming and land use practices. This would potentially produce new opportunities for low income or minority workers in the ROI in pursuing job prospects that support more environmentally-sound farming and land use practices.	The proposed action would potentially provide new employment opportunities that support more environmentally-sound farming and land use practices. When combined with other USDA programs, the cumulative impact may be increased employment opportunities and a more stable work environment for low income or minority workers in the ROI.
Wild and Scenic Rivers	Programs designed to enhance surface water quality also provide long-term beneficial impacts to wild and scenic rivers.	The overall goal of the proposed action is to improve water quality, and as such, water quality of the scenic rivers within ROI would also be improved. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit scenic rivers.

5.4 Irreversible and Irretrievable Commitment of Resources

As required by NEPA, any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented must be identified in environmental analyses. Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the effect that this use may have on future generations. Irreversible commitments are those that consume a specific resource that is renewable only over a long time period. Irretrievable commitments are those that consume a specific resource that is neither renewable nor recoverable for use by future generations. No irreversible or irretrievable resource commitments are expected from implementation of the proposed action.

6.0 MITIGATION MEASURES

6.1 Introduction

CEQ requires that all relevant reasonable mitigation measures that could improve a project should be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies (40 CFR 30 parts 1500 et seq., 2005). This serves to alert agencies or officials who can implement these extra measures, and to encourage them to do so. As this analysis is programmatic in nature and does not address exact locations, it is understood that detailed mitigation measures would be addressed on a site specific basis.

6.2 Roles and Responsibilities

As a part of the individual CREP contract approval process, consultation with the appropriate agencies would be conducted to reduce or eliminate potential impacts to resources identified in this PEA. For example, FWS would provide guidance to ensure that actions do not jeopardize or destroy threatened, endangered, or candidate species or their habitat. OSHPO and tribal agencies with cultural resources oversight would review actions to minimize potential impacts to cultural resources.

6.3 Mitigations

This chapter presents mitigation measures that would be used to avoid or lessen impacts to resources including biological, cultural, water, soil, air, and scenic rivers.

Biological Resources

- Current or historical grassland areas presently devoid of woody vegetation should not be entered into contracts that involve the planting of woody vegetation. Doing so would increase brood parasitism and predation on grassland nesting species and some neotropical migrant species by creating perch sites for avian predators, such as hawks and owls. It would also create travel corridors for terrestrial predators, such as skunks and raccoons.
- Factors affecting American burying beetle habitat selection are the presence or absence of carrion, and top soil and humus suitable for burying carrion. Therefore, it will be difficult to determine the presence or absence of this species on lands that may be enrolled in CREP. Since 1992, there have been confirmed sightings of American burying beetles in Cherokee and Sequoyah counties (OES 2005b). There have been unconfirmed sightings (defined as a likely sighting, but one that has not been confirmed by an entomologist or a FWS biologist) of the species since 1992 in Delaware and Adair counties. Consultation with FWS and the completion of project evaluation forms will need to be conducted prior to implementation of any CREP activities on lands that may hold American burying beetles (OES 2005b).
- The encroachment of vegetation on piping plover nesting areas due to habitat modification is a major factor affecting this species. Areas of known seasonal piping plover inhabitation should not be planted with any vegetation either on or in the vicinity of potential nesting areas.
- If riparian buffers are to be harvested periodically to restore productivity, some dead or dying snags should be left for cavity nesting species such as woodpeckers that may inhabit the area. Timing of harvests should not coincide with the breeding or rearing times of any sensitive species. It is expected that periodic harvesting would temporarily interrupt daily migration patterns of resident wildlife.
- CP implementation that requires the use of herbicides, pesticides, fertilizers, lime, or any other

such applications, as well as the timing of CP implementation, should be conducted in accordance with conservation plan recommendations to ensure no harm occurs to any fish or wildlife species, or to their associated habitats. Application of herbicides, pesticides, fertilizers, or lime would be strictly according to label instructions.

Cultural Resources

- OSHPO and any other State, Federal, and tribal agencies with cultural resources oversight should be consulted as individual CREP contract is developed and implemented, as appropriate. This would indicate if any cultural resources are known within the ROI or if additional field inventories would be necessary.

Water Resources

- Installation of CPs may involve the clearing of vegetation and some soil disturbance. These activities may result in high levels of sediment runoff, resulting in temporary adverse impacts to surface water quality. The use of filter fencing or similar mitigation practices and compliance with local and State regulatory requirements, such as obtaining stormwater pollution permits for construction sites over 1 acre, would reduce these impacts (ODEQ 2002b).

Soil Resources

- Short-term disturbances to soils during implementation of CPs may include tilling or installation of various structures such as fences, breakwaters, and roads. These activities may result in temporary increases in soil erosion. The use of silt fencing, filter fabric, or similar measures would reduce these impacts.

Air

- Implementation of the proposed CPs may include activities such as tilling and burning. This may temporarily increase particulate matter and other pollutants and adversely impact local air quality. Impacts would be minimized by measures such as watering exposed soil before and after tilling and burning in moderation and only in approved weather conditions.
- Installing various structures such as roads, firebreaks, and fences may require the temporary use of heavy-duty diesel construction vehicles. Primary emissions from construction vehicles include carbon monoxide and some particulate matter. BMPs would be used during construction activities to reduce the amount of emissions.

Scenic Rivers

- Installation of CPs may involve the clearing of vegetation and some soil disturbance. This may result in high levels of sediment runoff, resulting in temporary adverse impacts to water quality of the scenic rivers. The use of filter fencing or similar measures would reduce these impacts.

Environmental Justice

- Approximately 20 percent of the residents in the ROI fall below the poverty threshold, classifying the ROI as a poverty area. Removing lands from agricultural production may eliminate some farm worker positions; however, the preferred alternative is expected to generate other non-farm employment activities within the ROI. When contracts with farmers and ranchers are prepared, efforts should be made to identify displaced farm workers. These individuals should be preferentially hired to support CP establishment and maintenance.

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